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# RADIUM

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VOL. IV OCTOBER, 1914 No. 1

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A MONTHLY JOURNAL DEVOTED TO THE CHEMISTRY
PHYSICS AND THERAPEUTICS OF RADIUM
AND RADIO-ACTIVE SUBSTANCES

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# RADIUM

A MONTHLY JOURNAL DEVOTED TO THE CHEMISTRY, PHYSICS AND THERAPEUTICS OF RADIUM AND RADIO-ACTIVE SUBSTANCES.

Edited and Published by Charles H. Viol, Ph. D. and William H. Cameron, M. D., with the assistance of collaborators working in the fields of Radiochemistry, Radioactivity and Radiumtherapy.

Subscription $2.50 per year, or 25 cents per copy in the United States and Canada; in all other countries $3.75 per year.

Address all communications to the Editors, Forbes and Meyran Avenues, Pittsburgh, Pa.

VOL. IV OCTOBER, 1914 No. 1

## RECENT AMERICAN CONTRIBUTIONS TO RADIUM THERAPY

Only a few years ago there were but comparatively few men in America using the radium rays as a therapeutic agent. The greater number of physicians who even knew of radium regarded it as a mysterious substance notable mainly by reason of its exceeding rarity and the great difficulty with which it was to be obtained from the ore. Europe was the only producer and because of the demands over there, very little radium found its way to America. Meanwhile a great deal of pioneer work in the therapeutic applications of radium and other radioactive substances was being done and the interest in these substances and their effects was continually increasing. It was in 1913 at Halle that *Bumm, Doederlein* and *Kroenig* and *Gauss* announced the remarkable results which they had obtained in the treatment of uterine cancer by the application of massive doses of gamma rays from mesothorium and radium. These results were commented on by the whole medical world and the demand for the radioactive substances became so great that the supply for many months to come was soon exhausted and every effort was made to increase the radium output. No doubt the reports given at Halle were too enthusiastic and subsequently work has shown that the results obtained have not all been as successful as would have been expected. Those who had never used radium and had no conception of its power were the most bitter critics but in spite of their words it has come to be quite generally admitted that radium is of the greatest value in the treatment of many malignant and nonmalignant conditions.

The increased demand for radium stimulated the search for new sources of radium and in Colorado and Utah the carnotite deposits have been found to be the source of great quantities of low grade ore which are now being successfully treated; and the United States now contains the greatest known deposits of radium ore and is also the greatest producers of radium in the world.

The natural result of the great interest excited in radium and its production on a large scale in America has been an increased demand for radium in this country together with an ever growing appreciation of the power of the radium rays as a therapeutic agent.

In 1913 at the Minneapolis meeting of the American Medical Association there were but two papers announced which dealt with the therapeutic action of radium, and of these one was read by title only. At the Atlantic City meeting this year the therapeutic effects of radium rays formed the subject of five papers—all of which were read and discussed. Four of these have appeared recently in the August 22nd and August 29th (1914) numbers of the Journal of American Medical Association. In the following the results and opinions will be given in some detail:

Howard A. *Kelly* and Curtis F. *Burnam* (Baltimore). Radium in the Treatment of Uterine Hemorrhage and Fibroid Tumors. Journ. Am. Med. Assn. Aug. 22nd, 1914, pp. 622-8. Read before the Section on Obstetrics, Gynecology and Abdominal Surgery at the Sixty-fifth Annual Session of the American Medical Association, Atlantic City, N. J., June, 1914. In the past the surest control of uterine hemorrhage and the relief of pressure symptoms caused by fibroid tumors has been possible only by radical surgical measures. The authors find by a careful study of the local application of radium in certain types of these conditions—that this method offers a marvelous means of controlling and completely doing away with uterine hemorrhage and in the fibroid tumors they find radium secures the disappearance of these growths. The treatment with radium ranks in severity as scarcely more serious than a simple uterine curettage and in its brilliancy of curative results it fully equals radical surgical procedures, without the danger, pain and suffering and various post operative complications.

The benign conditions which the authors considered were grouped into four classes, excluding uterine hemorrhage due to cancer, and other malignant disease as well as that due to inflammatory disease of the adnexa or due to pregnancy and miscarriage.

"The first group includes cases in adult women in which there is marked menorrhagia, or metrorrhagia, with no disease of the pelvic organs, except perhaps a slight enlargement of the body of the uterus."

"The second group takes in most of the hemorrhages which occur in young girls. In many of these the local findings are exactly as in Group 1. In some instances the condition is similar to that found in Group 3 (polypoid endometrium). It is most important with these patients to avoid sterility and mutilation."

"The third group includes patients suffering with uterine

hemorrhages who show no pathological condition except an extensive polypoid overgrowth of the endometrium, which is generally termed polypoid endometritis."

"The fourth group includes true uterine myomas, whether they are causing hemorrhage or merely giving discomfort through pressure on adjacent organs. Here the true aim of treatment is not only to regulate or stop the bleeding, but also to bring about the complete disappearance of the tumor."

Carefully tabulated data is given with regard to all the cases detailing the amount of radium used, the length of application, etc.

"The technic advised is filtration through glass, 0.5 mm. of platinum, 0.5 mm. of zinc foil, and 0.3 mm. of rubber. Such an apparatus, suitably shaped, is carefully introduced directly into the uterine cavity. Cervical applications alone we find to be less reliable, demanding much more radiation to secure results. As a preliminary to the introduction of the radium, the patient is given nitrous oxide and then thoroughly curetted, and examined carefully under complete anesthesia; this is indispensable to good work. The amounts used intra-uterine in the fibroid cases have varied from 30 mgm. to 560 mgm. and the time of application from one and one-half hours to forty-eight. In the young girl class the amount of radium introduced has been as small as 12 mgm. In speaking of milligrams, radium element is meant; whatever the salt and whatever its purity, in all reports the amount in equivalent of radium element pure should be given. In the case of mesothorium, which varies with age, the strength equivalent to radium element at the time of radiation should also always be stated."

In the first group, that of bleeding uteri of adult women without any demonstrable pathological lesion, there were eight cases. The average age is 38 years, the youngest 27, the oldest 44. All were suffering from anemia and had not yielded to the palliative measures previously applied. The amounts of radium used varied from 60 to 268 mgm., the time of exposure from two to twenty-four hours. In two cases the bleeding never recurred after the first treatment. In the remaining five cases a normal menstrual period followed at the regular time to be followed by complete amenorrhea. The average time from treatment to complete amenorrhea was 3½ weeks.

Mild menopausal symptoms occurred in 3 cases, marked menopausal symptoms in 1 case, and none in 4 cases. The patients all left the hospital within forty-eight hours and except for a slight abdominal burning which lasted two or three weeks and which was accompanied by some leukorrhea, have had no bad results. All now report themselves in good health.

"In the second group, which includes young girls who were bleeding, there are 5 cases. The ages varied from 13 to 23, the average being 18 years. In addition to the usual medicinal treatments, all but one had had curettages and one had had a resection of the ovaries, with the idea of diminishing the period. All were in general good condition except for the anemia, with the exception of Case 5, in which there was extreme organic heart disease. The amount of radium used varied from 12 to 60 mgm. The time of

application ran from five to twenty-four hours. In the first three cases the menstrual periods have returned to the normal type and the patients recovered a normal hemoglobin content."

"In the third group, of adult women with uterine hemorrhage and no disease except a polypoid endometrium, there are five cases. The average age was 43 years; the oldest 49 years, the youngest 35 years. Except in Case 1, in which a combined uterine abdominal and vaginal application was used, only the intra-uterine method was used. The amount of radium employed varied from 100 to 30 mgm. The duration of the treatment was from twenty-two to seven hours. With the exception of Case 1, in which bleeding led to hysterectomy five days after application, all were relieved at once by the single application. All these patients were anemic, all had resisted other forms of treatment, all have regained their normal condition since treatment. In 2 cases menopausal symptoms were slight. In 2 cases they were not present. Case 1 is not included as here oophorectomy and hysterectomy was carried out."

"In the fourth group, which includes the fibroids, there are 21 cases; the average age is 44; the oldest 59 years; the youngest 32 years; menorrhagia, metrorrhagia or both, were present in 19 cases; in one there was normal menstruation, in one no menstruation, as patient was six years past menopause."

"The tumors with one exception were either large or middle sized. By large we mean those reaching half way to the umbilicus or larger, while middle-sized tumors include those from the size to a two and a half months' pregnancy half way up to the umbilicus."

"In 3 cases the tumor was definitely submucous. With the exceptions of Case 5, in which there was an ovarian cyst, and Case 16, a cystic ovary, and Case 20, chronic pelvic inflammatory disease, and Case 8, marked exophthalmic goiter, and Case 10, infection of the tumor and uterine cavity, the fibroid condition was uncomplicated."

"These patients almost invariably suffer from nausea for twenty-four hours, and from abdominal tenderness for from ten days to three weeks, and some of them have leukorrheal discharge for a few weeks. The symptoms above enumerated have been much less marked when large amounts of radium are used for relatively short times. In only one case, No. 20, has any serious complication followed the treatment. Here an inflammatory process was lighted up and a pelvic abscess formed. It healed, however, without operation, and the patient is perfectly well today."

"In 16 of the 21 cases of hemorrhage, complete amenorrhea has been obtained; immediately after the treatment in 6 cases, at the end of one month in 4 cases, at the end of two months in 4 cases, at the end of several months in one case in which the milligrammage and hours were small. In one case the patient is six years beyond the menopause and there was no bleeding. In one case the treatment failed. In one case, the time since treatment is too short to state the effect. In two cases, and these in our opinion are most important, the menstrual periods have persisted regularly and the tumors have disappeared."

"This happy result must be due to the fact that the fibroid

has received much more intense radiation than the ovaries, and serves to point the way in which to extend our efforts in this field, that is, to secure a maximum effect on the tumor with a minimum treatment of the ovaries. This observation, which reverses the European technic, is possibly applicable to Roentgen ray as well as radium treatments."

"With intense radiation on the fibroids, the reduction is usually rapid, occurring within two or three months. Where the principal effect has been on the ovary, the disappearance may be much slower extending over months or even years, as in the cases reported by Robert *Abbe.*"

"As compared with the Roentgen ray, radium is simpler of application, more rapid in bringing about the desired effect, and finally is better in that it acts on the diseased organ, the uterus, with more intensity than on the ovaries. Radium offers the possibility in the fibroid cases of doing away with the tumor without destruction of the ovaries."

"We also insist that the fibroid itself should receive the major radiation, whether with the Roentgen ray or with the radium."

"The radium can bring about a complete amenorrhea at any age."

"The menopausal symptoms which follow this amenorrhea are absent in 50 per cent. of the cases and mild in nearly all of them."

"We insist on the intra-uterine application, in contradistinction to the vaginal or cervical, and in this connection wish to contrast the shortness of the radiations in hours as compared with the exposures reported by *Cheron* and *Gauss* and *Krinski.* We feel that it is quite possible that suitable abdominal radiation with radium or the Roentgen ray may add to the rapidity of the results."

Frank E. *Simpson* (Chicago). Radium. Its Use and Limitation in Skin Diseases. Journ. Am. Med. Assn. August 29, 1914, pp. 737-741. Read before the Section of Dermatology at the Sixty-fifth Annual Session of the American Medical Association, Atlantic City, N. J., June, 1914. The author limits his discussion to the use of radium in dermatology and reports only on the treatment of cases of epithelioma, lupus erythematous and angioma. He emphasizes the importance of proper technic, the latter to be only learned through a certain amount of experience with the applicators used. For obtaining best results in treating skin diseases the author uses the so-called varnish applicators. These consist of a radium salt incorporated in a varnish which is spread on a suitable holder. The "toile" or cloth applicator is made by spreading the varnish upon a piece of linen. Another form of varnish applicator has a metal back and this type is used in the full, half and quarter strength. A full strength applicator contains the equivalent of 10 milligrams of pure radium bromide (5.3 milligrams of radium element) per square centimeter of varnish surface. The half strength and quarter strength contain the equivalent of 5 and 2.5 milligrams of pure radium bromide per square cm. The salt used in making these applicators is the sulfate. These applicators are used either naked, that is wrapped in

thin rubber tissue, or with screens of metal interposed between the radium and the skin. The author prefers screens of aluminum or silver—which when used are to be covered with five to ten thicknesses of paper to absorb secondary rays—the whole apparatus being enveloped in rubber tissue and applied to the skin by adhesive or rubber bands..

The author says "Radium reactions in the skin have sometimes been compared too closely with Roentgen-ray reactions. In general, radium reactions are much more benign than Roentgen-ray reactions, and when destructive inflammation has been produced, healing is much less slow and uncertain. This is especially true of the reactions in which beta-rays predominate, but even severe gamma-ray reactions are more benign than severe Roentgen-ray reactions."

"It has been sufficiently demonstrated that radium is a very efficient agent in epithelioma of the skin. Up to the present time I have treated about forty cases. To a certain extent these were selected cases, being of the type usually treated by the dermatologist. In two of these cases success was only partial; but healing, I believe, might have been brought about had I been able to continue the treatment. The general experience, however, leads to the belief that certain epitheliomas are probably resistant to radium as well as to other forms of actinotherapy, while other cases are too far advanced to be materially benefited. It would be premature to try to draw conclusions at present as to the relative efficiency of radium and the Roentgen-ray in epithelioma. Both agents, I believe, have distinct fields of usefulness in this disease."

"Epithelioma may be healed with radium, applied without or with a screen. Without a screen, an epithelioma 2 or 3 cm. in diameter and not too deeply situated may be healed with a one-fourth-strength applicator in five or six treatments of an hour each. With a screen of 0.1 mm. of silver, eight hours may be required. Recently I have made more frequent use of screens in order to limit the inflammatory reaction and because experience has shown that the deeper parts of the growth are probably better reached. An epithelioma can also be healed with a single massive dose of heavily screened radium, but I have hitherto preferred to use fractional doses. The method of operation is determined solely by the nature of the growth and the convenience of administering the treatments. The cosmetic results are equal if not superior to those obtained by any other method."

"About twenty cases of lupus erythematosus have been treated. In view of the intractable nature of this disease, the results of radium treatment are on the whole very encouraging. In selected cases I have been able to obtain complete involution of the disease. Unfortunately, relapses may occur; but these so far have yielded to persistent treatment. The painless character of the applications enables one to pursue the treatment vigorously. The technic has much to do with success or failure. The chronic "fixed" types are best treated with destructive doses. Experience with this disease has led me recently to prefer screened radium. I now use in the average case a one-fourth- or one-half-strength applicator screened with 0.1 mm. of silver, and treat each patch from

about four to six hours in the course of two weeks. The inflammatory reaction is thus rendered less severe than when naked radium is used. Unfortunately, some patients, when they first come under observation, are more or less scarred by the disease or by previous treatment. Even in these cases the cosmetic result is sometimes quite satisfactory. In selected cases of not too long duration or of too large area a very good cosmetic result has been obtained."

"The results obtained in certain types of nevus vascularis (birth-marks) are superior to those obtained by any other method. In a certain number of angiomas radium offers the only practical method of treatment. It is particularly successful in the angiomas of children on account of its painlessness."

"Large flat angiomas (port wine stains) of deep red color can often be treated with good cosmetic result. While amenable to several different technics, 'port wine stains' are most successfully treated by giving just enough raying to produce a marked erythema with desquamation. With a one-twentieth-strength applicator screened with 0.01 mm. of aluminum the proper amount of reaction can be produced in about four or five hours. Several repetitions of this treatment will often result in a satisfactory decolorization."

"Elevated, papillomatous angiomas must be treated with slightly stronger doses in order to level the surface and bring about decolorization. With a one-fourth-strength applicator, unscreened, an exposure of from two to four hours may be given in fractional doses. When the reaction subsides, the series of treatment may be repeated if necessary. Several courses of such treatment will usually bring about the desired result."

"With certain types of cavernous angiomas in children, a reduction and leveling of the tumor can sometimes be produced without visible inflammatory reaction. This shows the specific and selective action of radium on the blood vessels. In these cases I have used either a one-half or one-fourth-strength applicator screened with 0.1 mm. of silver, and have given exposures of fifteen or twenty minutes duration."

"To attain the best results in angiomas, infinite care and attention to detail are needed. While the cosmetic results are naturally not always absolutely perfect, the enormous improvement is so noteworthy as to be nearly always satisfactory to patients. In selected cases an almost perfect cosmetic result can be obtained."

Arthur F. *Holding* (New York). The Relative Value of Radium in Dermatology. Journ. Am. Med. Assn., August 29th, 1914, pp. 741-3. (Read before the Section on Dermatology at the Sixty-fifth Annual Session of the American Medical Association, Atlantic City, N. J., June, 1914.)

"On account of the extravagant exploitations of radium by the profession as well as by laymen, a statement as to its actual value as a therapeutic agent (at present) may be enlightening. The majority of physicians are not in a position to judge the merits of this element, because its scarcity and high price place it beyond their reach. Judging from the unusual publicity accorded the discovery of this new chemical, with its marvelous physical prop-

erties, it was logical to expect that the therapeutic results would be quite phenomenal; but such results take years to perfect. The premature, hothouse exploitation of radium, hybridized by a cross between its unusual phenomena and the publicity given them, have resulted in disappointment, which was to be expected. After the initial period of exploitation, every new therapeutic agent goes through an evolutionary period in the hands of those who are scientifically inquisitive, and eventually its true value is established. For instance, the Roentgen rays, which were discovered seven years before the discovery of radium, are now just beginning to be employed scientifically, and it will be some years hence before the prejudice and scepticism resulting from premature, unscientific and extravagant exploitation of the Roentgen rays can be dispelled. In the same way the preposterous claims of radium fanatics provoke one to an underestimation of its value."

"For two purposes one must acknowledge that radium has greater possibilities than any other similar agent in use at present, namely, (1) in diseases of faulty metabolism, in which the radium emanation may be used, and (2) in malignant lesions of cavities, in which the neoplasm is inaccessible or difficult to expose to direct application of Roentgent rays, such as the esophagus, rectum, vagina, urinary bladder, fauces, etc."

Dr. *Holding* thinks it necessary to use radium in the treatment of benignant growths since they can be controlled by other methods although it is true that radium will give good results in non-malignant and skin conditions such as warts, moles, nevi, acquired blemishes like tattoo marks or keloids, lupus, urethral caruncles, mycosis fungoides, blastomycosis and acne. For superficial lesions surgery is contraindicated, because better cosmetic results can be obtained with less danger and less pain by non-surgical methods. Psoriasis, eczemas and skin diseases due to faulty metabolism should be treated by systematic measures, including radium emanation, and when this does not produce desired results, electrical methods such as massive Roentgen rays are indicated. He admits that the superior penetrating powers of radium justifies the expectation of better results from radium than from the most penetrating Roentgen rays.

"The field of usefulness of radium has been greatly increased since the employment of radium emanations. The present method is to draw off the emanations of radium into glass capillary tubes, which retain for about twenty-four hours a radio-activity approximately equal to that of the original radium."

"In the field of local applications to lesions of the skin and mucous membrane the agents to be compared with radium are electrical desiccation (*Clark*), ultraviolet rays (as applicable from a *Kromayer* lamp), massive doses of Roentgen rays of controllable penetration (*Coolidge*), surgery and destruction by caustics, cautery or cold. In comparing the relative value of these methods the points to be considered are:

1. Cost: Radium is far more expensive than any of the other methods. Massive Roentgen rays, electrical desiccation and ultraviolet rays come next in expense. Surgery and caustics are the cheapest.

2. Ease of Application: As to ease of application, much depends on the training of the person who administers the treatment. Each therapeutist will naturally do the best work with the greatest ease by employing that agent with which he is most familiar. Other things being equal, radium and caustics are easier to apply than the other agents in question.

3. Time Consumed in Treatment: Radium applications are much longer in duration than any of the other methods. They require hours while the other treatments require minutes.

4. Pain: Radium, Roentgen-ray, and ultraviolet light treatments in proper dosage cause no pain. Electric desiccation and carbon dioxide snow cause slight pain. Surgery and cauterization are very painful and require a local anesthetic. Chemical caustics are the most painful.

5. Cosmetic Effects: Cosmetic effects are best after radium, Roentgen-ray, ultraviolet light, desiccation and carbon dioxide snow, and poorest after surgery or cautery.

6. Dangers: With a proper technic there are no dangers in any of these methods. Poor technic is a de facto contraindication for the use of any agent.

7. Superficial Healing and Deep Extension: The well demonstrated superficial healing powers of radium and the Roentgen-rays should not mislead one into attempting to cure too extensive a lesion with these agents alone, lest the lesion make deep inroads while valuable time is wasted on superficial healing."

"In deeper malignant conditions of the skin, the following therapeutic program should be adopted:

"1. Massive Roentgent deep therapy or massive radium deep therapy."

"2. Complete radical operation, preferably by bloodless methods such as thermopenetration, electrocautery, or massive caustics (*Stroebel*).

"3. Effulguration (*de Keating-Hart*) into the wound."

"4. Postoperative Roentgen deep therapy or massive radium deep therapy."

"In hopeless malignant skin conditions the patient's symptoms can frequently be much ameliorated by massive deep Roentgenotherapy or radiotherapy."

William S. *Newcomet* (Philadelphia). Radium and Roentgen Rays in Radiotherapy. Their Uses and Limitations. Journ. Am. Med. Assn. August 29th, 1914, pp. 743-7. (Read before the Section on Pharmacology and Therapeutics at the Session of the American Medical Association, Atlantic City, N. J., June, 1914). Comparing the gamma rays of radium and the X rays the author points out their physical difference as manifested in the much higher penetrating power of the former. This difference is very important in considering the physiological effects of the rays. While the softer rays are most active it is because of their lack of penetration that burns follow their indiscriminate use. The harder or more penetrating rays are not so active in producing the tissue changes but the effects produced are more uniform, since only a small part of the radiation is absorbed in any cell. The

dosage of the radium rays can be controlled quite exactly whereas this has not been the case with Roentgen-rays. The burns produced by these two kinds of rays offer evidence of their difference. Burns from radium rays heal rapidly, while those from Roentgen-rays are very slow to heal. Radium has even been used to remove the effects of Roentgen-rays. Under certain conditions the radium rays are to be preferred because of the ease with which they may be applied, notably in cancer in cavities as for instance in the mouth, rectum or vagina. "In cancer of the uterus radium seems to possess a control that is not observed from any other form of treatment, and while it is rarely permanent it gives comfort to the patient and materially alters the course of the disease." In some instances carcinoma of the palate and others of the buccal mucous membrane have been healed. "It must not be understood, however, that these radioactive elements are a panacea for cancer; they are far from it; but individual results are often seen that are most gratifying." "Certainly the superficial epithelioma is in most instances probably relieved by both the radium rays and the Roentgen-rays. The cosmetic results are exceptionally good and possibly in those cases in which the Roentgen-rays have failed, radium often produces the desired results." "The true rodent ulcer with its undercut edges, which has penetrated below the superficial tissues, is rarely cured by any form of treatment."

"In deep cancer the choice between massive doses of deep radiation and the employment of these radio-active elements must be considered an open question. Its employment in new growths as sarcoma and fibroma is a matter of individual opinion, and results have been reported from advocates of both; the only possible advantage of these radio-active elements is the ease of manipulation. But it should be remembered that the failure of one form of radiation is no criterion of the other."

"There is one field, however, in which these radio-active elements displace the Roentgen-rays: that is, in the treatment of nevi, either the simple port-wine stain and the deeply pigmentated mole, or those with slight vascularity to those of the deep cavernous variety. While these lesions have been treated by the Roentgen-rays, the method is extremely dangerous and the results are usually poor. On account of the vascularity, the character of the burns sometimes produced will cause ulcerations that last for years, and when healed give rise to scars with more or less telangiectasis that are as a rule more unsightly than the preexisting nevus."

"The comparsion of dosage between these two forms of radiation is an impossibility; the existing difference in their physical nature, their physiologic action and the mode of application does not permit it. The wide difference of opinion existing between individuals using the same form of radiation make it difficult to analyse the results, which in all events depend largely on the manner and skill of employment rather than the quality and quantity of apparatus. Therefore at present dosage in all fields of radiation is a variable quantity that must depend entirely on the opinion of the operator."

"From this short analysis of the two forms of radiation we may conclude that:

1. Both forms of radiation have wide ranges of usefulness that differ materially under certain conditions of disease, individual idiosyncrasy and adaptability of usefulness to the affected part.

2. There is, however, a wide middle ground in which the two forms of radiation overlap, their employment being a matter of convenience.

3. The use of both forms of radiation in some instances yield results, when one alone would fail."

Arthur F. *Holding* (New York). The treatment of Cancer by Electrical Methods. With and without Surgery and Radium. New York Medical Journal, September 19th, 1914. pp. 557-60 (From the Physical Laboratory, Huntington Cancer Commission, General Memorial Hospital.) The author says that the results obtained were due, not so much to any originality of methods as to the correlation of very excellent methods which have already been described, but are little understood and seldom used by the profession at large. Inasmuch as we have been treating these cases only during the past eighteen months, sufficient time has not elapsed to warrant any final statement concerning the successful cases, other than they are now symptomatically well.

"For our purposes malignant lesions may be devided into three classes, i. e., those in the first, second, and third degrees of malignancy."

"The first degree of malignancy (a) Cases having superficial skin lesions tending to extend out rather than into the underlying structures. (b) Those which do not extend more than one cm. beneath the skin. These are characterized by slow growth, long duration, and a tendency not to metastasize early."

"Histological characteristics. Growths of this class of malignancy in our series showed the histological formation of papillary epthelioma, basal celled epithelioma, mycosis fungoides, and pre-epithelial keratoses."

"Prognosis. The prognosis of such cases treated by the foregoing methods is 100 per cent good. They can be cured by physical methods, without surgery, pain, hemorrhage, opening up the lymph channels, danger of infection, implantation of malignant cells, or hospital confinement, and with the best cosmetic results."

"Therapeutic methods. These cases should not be treated by cutting operations. The physical methods indicated in the order of their preference are: (a) Massive doses of Roentgen-rays; (b) desiccation; (c) radium; (d) destructive caustics, provided the more expensive equipments are not available."

"If improperly treated or neglected, these cases may develop into cases of the second or third degree of malignancy."

"The second degree of malignancy. (a) Those operable tumors which tend to extend rapidly into the deeper structures, are characterized by rapid growth and tend to metastasize early. Carcinomata of the breast and operable sarcomata are very good examples of this class."

"Histological characteristics. Growths of this class of malignancy in our series of cases showed the histological formation of basal celled epithelioma, and alveolar and medullary carcinoma of the breast."

"Therapeutic methods. This class of cases should be treated by the following program: (a) Preoperative massive doses of Roentgen-rays; (b) thorough radical operation; (c) fulguration at the time of operation; (d) postoperative deep Roentgen-therapy or radiotherapy. By the use of these adjuvants to surgical treatment, the percentage of recovery in this class of patients has been materially improved."

"The third degree of malignancy. Inoperable, superficial and deep malignant conditions."

"Prognosis. These patients as a rule cannot be cured by any method of treatment and are undesirable subjects, as the ultimate prognosis is 100 per cent bad."

"Therapeutic methods. The symptoms can usually be improved by electrical methods and radium."

"The foregoing division of all cancers into three classes of malignancy, is valuable for determining both the prognosis and the treatment. Cases of the first degree of malignancy may be cured; cases of the third degree of malignancy cannot be cured. Much time may be lost in cases of the second and third degree of malignancy and the patient's life endangered if one is deceived by the well known superficial healing properties of radium as well as the X-rays. The fact that lesions of the second degree of malignancy appear at first to improve under treatment indicated only for cases of the first degree, gives a false sense of security and results only in therapeutic procrastination."

The following conclusions are given:

"1. Incipient surface cancers can be cured (a) if superficial —by physical methods; (b) if deep—by physical methods and surgery."

"2. The physical methods employed include massive X-ray doses, desiccation (*Clark*), fulguration (*de Keating-Hart*), diathermia (*Nagelschmidt*), and radium."

"3. Beginning cancer of the gastrointestinal tract can be diagnosed with accuracy by recently improved X-ray methods."

"4. Advanced cancer, either internal or external, cannot be cured."

"5. The successes herein reported are due not to the discovery of any one new factor, but rather to the combined application of the best and most efficient electro-physical technic, both in early diagnosis and prompt treatment, the results of which, if permanent, are invaluable."

"6. The methods herein advocated are very costly."

"7. If this work is to be continued, sufficient money must be raised to carry it on. This means, for institutions proper endowment; for individuals, the establishment of adequate fees."

Carl *Fisher* (Rochester, Minn.). Epithelioma of the Lids. Journ. Am. Med. Assn. August 29th, 1914, pp. 751-5. (Read before the Section of Ophthalmology at the Session of the Am. Med.

Assn., Atlantic City, 1914). Referring to the use of radium and Roentgen-rays in the treatment of epithelioma of the eye lid the author speaks as follows:

"The comparison of these (by operation) results with those obtained by the use of radium or Roentgen-rays or pastes is difficult because of the absence in most papers on the subject of definite data regarding the duration of the cure. *Williams* and *Ellsworth,* however, are not remiss in this regard. Of the nineteen cancers of the skin of the lids, two-year cures are reported in thirteen cases, or 68 per cent. These are evidently not intended to include cases with orbital involvement, since one case of orbital involvement is listed separately. The percentage of two-year cures by operation in our series was 84."

*"Pinch,* in a report of the Radium Institute of London, classified his cases of rodent ulcer into apparently cured, thirty-one; "improved", forty-one; not improved, twelve; abandoned treatment, six. Counting improved, not improved and abandoned as failures (as was done in our series), the percentage of cure is far from satisfactory (about 39 per cent.) and this without any minimum time-limit set. It should be said, however, that these were rodent ulcers of various regions and severities, so that the comparison is not altogether fair. *Pinch* was able to state on this showing that "rodent ulcer is of all cancers the most amenable to radium treatment." *Turner* cured six out of nine completed cases of rodent ulcer of various parts of face and lips, or 66 per cent., time not stated. The best opinion at present concerning radium versus operative treatment of these cases is well summed up by *Knox."*

"1. In all cases of early cancer, the operative method is undoubtedly best; it is quicker, safer and offers the best prospect of cure. . . 3. In patients who refuse operation or are otherwise unfit for operation, radium is a useful remedy."

"The Roentgen-ray is believed to owe what efficiency it possesses to a ray corresponding to the gamma ray of radium, so that there seems to be no reason for preferring it to the latter (save its greater accessibility) since the curative rays are acknowledged to comprise only a small part of the whole Roentgen ray. In point of fact, the Roentgen ray cannot be regarded as a dependable agent in the treatment of epitheliomas, however useful it may be as a palliative or postoperative measure."

"The present evidence seems conclusive that operative measures are, in general, the safest means of treatment we possess for epitheliomas of the lids (and for that matter in any other region), and especially when the growth is rapid and adherence to periosteum or involvement of the orbit has taken place or evidently will take place. On the other hand, when the patient can be kept under observation until a cure is completed and the growth is proceeding slowly, there seems to be no reason why radium should not be used. In cases of this kind, however, it has the disadvantage of slowness, and there is also the difficulty, in most places, of obtaining the radium. But many patients prefer any amount of treatment to the use of the knife, a psychological factor that is

heavily featured in the advertisements of the clever charlatans. The cosmetic results of successful radium therapy are excellent; I have seen no injury or reports of injury to the eye from its use; it is practically painless. In this as in any therapeutic or surgical method, the experience and ability of the physician in charge plays an important role, especially in pioneer work with comparatively new methods of treatment."

"The importance of early and radical operation in epitheliomas with orbital extension is well emphasized in the statistical data given above. Unless the growth is so clearly circumscribed that complete removal without sacrificing the eye is certain, a complete exenteration of the orbit followed by cautery is imperative. Extension to the sinuses renders the prognosis nearly hopeless; in such cases, if operation is decided on, it should be followed by the persistent use of radium or by Roentgen ray if the former is not available. Glandular involvement, without orbital extension, does not necessarily indicate a bad prognosis, granting that a proper resection of the gland-bearing fascia be made."

Robert *Abbe* (New York). The Efficiency of Radium in Surgery. Ohio State Medical Journal, August, 1914, pp. 461-5. (The annual address in Surgery read at the General Session, Ohio State Medical Association, Columbus, May, 1914).

"In view of the enormously exaggerated newspaper claims of its power to destroy disease, which have justly filled your minds with doubt and disbelief, and which is not in your power to controvert, your committee has asked me to speak the truth on this engrossing theme. Truth is revealed slowly in science—as words spell themselves out letter by letter. The whole truth about radium will be written years hence, but we have passed the first decade and its importance still grows."

"We are dealing with a wonder-working mineral unlike any other agent in our hands. While it resembles the energy of the Roentgen-ray, it is unlike it in many ways."

After telling of the physical properties of the radium rays and the methods used in applying radium the author says: "Perhaps the first unqualified proof of its conquest of disease was in its dissipating the epithelial cancers of the face."

"A natural question now arises. Is there here a specific action? Is there a selective action against the component cells of a tumor discriminating in favor of those of healthy growth? We answer, yes, and offer proof by several facts. First, consider myeloid sarcomas. A myeloid sarcoma is an overgrowth of the myeoblasts of the bone marrow. As they increase enormously they destroy the calcific bone by pressure or absorption, until all semblance of the bone is gone, and is replaced by a pultaceous mass of soft tumor. In the near future the life of the patient may be sacrificed. During the growth of the tumor a correct dose of radium is given, and the cells not only cease growing but retrograde, and permit a reformation of the bone with its original structure and form. We have to assume that the enormous production of marrow cells has been reduced by atrophy and absorp-

tion during the cure, and, that, out of the riotous overgrowth of new weak cells the primative cells have reassembled and returned to their normal life work. That certainly seems like a selective action against weak cells."

The author then speaks of successful results obtained in the treatment of myeloid tumors of the jaw, round celled sarcoma of the parietal bone, papillomata in the larynx, basal celled epitheliomata, myomata and uterine fibroids by means of radium rays.

"It becomes us now to speak of some contrasting failures in a different type, the sarcomas which are composed of spindle cells sometimes mixed with a few large free cells, springing from and destroying true myelo-placques. I have vainly endeavored to bring about a retrograde change in these tumors for many years, but have made no favorable impression on them, thus far, by radium. The squamous celled type are prone to invade the nearest lymphatic gland which the basal celled tumor does not. By this the surgeon will be warned to resort quickly to thorough use of his keenest dissecting skill. Fortunately, this type is relatively infrequent."

"It is evident, then, that discrimination in using radium is essential, most of all in the choice of cases, if we would bring this efficient agent into repute for its true value."

"If we could radiate the disease in its early groups, we could end it. Such facts exist. I have one patient whose cervix curettings showed early invasion of the submucous structure by proliferating epithelium, a typical early cancer in which radium treatment alone has given a cure of nine years. In only one other form of beginning cancer, that of the breast where it begins as a epithelioma of the nipple, for which surgeons would always advise mammary amputation, have we an opportunity to test radium in the early stage. In six such cases I have caused prompt disappearance of the growth and maintained subsequent health for several years."

"During the years of trial I have necessarily tested radium in many of the massive and inoperable types of cancer, hard scirrhus breasts, encephaloid tumors, large fungating rectal cancers and tongue cancers of all stages. So that out of the mass of the history of ten years I can speak in general terms with some precision."

"It is no small tribute to radium to say that in one-tenth of these active cancers a retardation can be seen and one-third, in time, added to the expectation of life."

"The method of action of radium in cancer does not seem to me to be specific. Ten years ago I satisfied myself that radium kills the cancer cells in the groups nearby it, but within a limited radius, perhaps a quarter of an inch, and, that, to destroy large masses many tubes must be placed throughout the tumor. In such cases there was always tissue necrosis with more or less toxaemia which passes away safely. This method of attack is quite like that of *Kroenig, Bumm, Voight,* and others who have given massive doses in uterine cancer to radiumize the gross mass and have felt that better results were attained than by excision. Experimental work in this field is still being conducted, not without hope."

"One practical, and demonstrated gain to surgery, is seen in the principle enunciated by *Wickham* that if all the massive cancer canot be removed, radium can be successfully applied to the thin cell of disease necessarily left, with the certainty that it will be destroyed. In one patient I was obliged to leave a thin layer of cancer grown to the wall of the carotid artery at its origin, which, however, I radiumized in situ. Five years of perfect health have gone by with no recurrence. This principle of killing and safely leaving a small remnant of malignant tumor, is of the greatest importance to surgery. It applies to every part of the body. Hence, the postoperative use of radium promises to be a material advance."

"Not the least important role played by radium is in its special influence in causing retrograde in hypertrophic grandular structures like thyroids, lymph adenomas, lympho-sarcomas, parotids, etc. This widens the important field of usefulness. I have treated half a hundred goitres of all varieties by radium alone, and have seen complete disappearance in a few and checked the growth in many. The ideal treatment for most troublesome cases is thyroidectomy. Nevertheless, there is a large proportion of goitre patients either not greatly annoyed, or unfit for surgery, where radium is applicable."

"Every physician feels the sense of helplessness when confronted by advanced cancer of the tongue. Even with thorough surgical extirpation early return of the disease is well night certain. I have been impressed by the temporary improvement in many bad cases after using radium and have now adopted the combined extirpation followed by radium with a degree of hope, because of some cases of long freedom where the half tongue was first removed. Several years will be necessary to speak of cures."

"It is difficult to know where to draw the pathological lines on tumors affected favorably by radium. It would almost seem as if all aberrent cell growths ought to be controlled, if some are, but certainly at present it seems that the myeloid and round celled sarcomas and all tumors of lymphoid type yield wholly or in part and that basal-celled, but not squamous-celled growths are consistently curable. Tonsil sarcomas, some gliomas, pharyngeal neoplasms all yield some cases to the credit of radium. It is far too early to classify the types."

"It is fair to say in conclusion that, stripped of all extravagant claims, radium is an asset of permanent value to surgery in the treatment of those diseases some of them justly called malignant which I have heretofore defined. In the graver form of cancer, which has so long baffled us all, some definite progress has been made as described, but, hard research work must yet be done before someone puts his finger on the weak spot in its method of use."

"Finally, let me add that one must pardon the occasional outburst of enthusiasm from those who are beginning the use of radium and are startled by its revelations. These are more than offset by the occasional tirades against it by those who have never used it, or who have some other method to exploit. Both these are natural as they are negligible. They do not affect the real

truth that as an agent for the relief of human suffering radium has proved to be a weapon of unique value in the surgeon's hands."

W. H. B. *Aikins* (Toronto). Personal Experiences with Radium. Canadian Practitioner and Review. September, 1914, pp. 535-45. (Read at the Meeting of the Canadian Medical Association, St. John, N. B., July, 1914).

"It was in Paris that I first had the opportunity to see the results of the use of radium, and I saw them for three years in succession before I was tempted to invest in a small quantity of the precious metal. With this small placque I had such remarkable success in the treatment of rodent ulcer in patients, which several of my colleagues were good enough to send me, that to my mind at least radium as a therapeutic agent had come to stay. Gradually further quantities have been added to the armamentarium, so that lesions can now be treated which at first were quite out of the question."

"Altogether I have to date (June, 1914) records of 387 cases treated with radium. I am free to confess that the results in all these cases were not what was hoped for. There are certain types of malignant growths, which I would hesitate to take and do refuse now, over and over again, for which at first I tried to do something. On the other hand, there have been results which have surprised me, and improvement has sometimes been noted when none was expected. The point comes in here as to whether one is justified in taking cases for treatment where cure cannot be looked for. I think so, providing a proper selection is made. One naturally does not care to treat moribund cases, as certain colleagues have occasionally asked me to do. On the other hand, radium as a palliative measure very often relieves pain, controls hemorrhage, lessens offensive discharge and undoubtedly prolongs life. Surely the physician's duty in such a case is plain. It is not our province to hold up our hands and say, "Go home and die," if we know we can be of some, even temporary, service. If radium is capable of affording even such temporary relief in inoperable cases in which formerly nothing whatever could be done to mitigate the sufferings of the patient, it represents an adjunct to palliative treatment which must be regarded as of inestimable benefit."

"Of the 387 cases, 271 are causes of malignant disease, while the remainder comprised benign growths, such as papillomata, angiomata, naevi, port-wine stains, cheloid, together with various other dermatological lesions such as eczema, psoriasis, tuberculides, lupus, etc. These figures serve to clear up an erroneous idea which is widely prevalent both among the profession and the laity that cancer is the only condition for which radium is used. On the contrary there are many varieties of pathological conditions which respond well to radium treatment. Of the 271 cases of malignant disease 116 are of rodent ulcers, 27 are true cutaneous squamous-celled epitheliomata; 27 carcinoma of the breast, 22 of the uterus, 14 of the lip, 5 of the tongue. There are 20 cases of sarcoma and of endotheliomata."

"I do not wish in this paper to dwell at any great length on the great field of usefulness that radium has in dermatological practice. On papillomata it acts as a charm. Port-wine stains and angiomata are removed. I have had 17 of the former and 9 of the latter. On lupus, while not a specific, it produces very good results. Cheloid is influenced in a specific fashion. Eczema and psoriasis also are greatly benefited. Radium is so useful in this department of medical science alone that, leaving out of consideration its influence on malignant growths, it is a powerful adjunct to the armamentarium of anyone undertaking to treat skin lesions."

"Dr. Robert Abbe, of New York, was the first to use radium for goitre, when in 1905 he treated a case of exophthalmic goitre by inserting radium tubes through an incision into the gland. In eight weeks the goitre had considerably diminished. The nervous symptoms disappeared, and the patient has remained well since."

"I have used radium in sixteen cases of goitre. Ten of these showed evidences of hyperthyroidism, while six were of the simpler variety. Of the ten exophthalmic cases, in seven the improvement has been gratifying. The nervous symptoms disappeared, and the enlarged thyroids have decreased to a remarkable extent."

"In one case, which I should like especially to refer to, the circumference of the neck was reduced from 16¾ to 12¼ inches by radium treatment of five months' duration, carried out between November and April."

"In another case enlargement of the thyroid had been present for some years, involving especially the middle and right lobes, the circumference of the neck being 15 inches. It has lately been producing constitutional symptoms. In a comparatively short treatment of 100 mgm. hours of radium the goitre decreased so that the circumference of the neck was only 13 inches, and the nervous symptoms quite cleared up."

"In two of my ten cases of exophthalmic goitre the improvement, though considerable, was not complete, and in one no improvement resulted."

"Of six cases of simple goitre, in four considerable reduction occurred in the size of the gland, the neck decreasing in circumference from three-quarters to one and a half inches, with almost complete disappearance of the enlargement. In one case though there was a reduction of one inch in the circumference of the neck, a large mass remained present, and in one other, which was reduced three-quarters of an inch, the bulk of the goitre still remained. This particular one had been present for ten years. A great deal of fibrosis had evidently taken place, and, therefore, resolution could not so readily occur."

"It is now, I believe, universally recognized that radium treatment is the best means of attacking rodent ulcer. The only cases which may not respond so readily are those which may have extended down to the cartilage or bone, or where the area of ulceration is so large that satisfactory epithelialization cannot occur. Even in these cases, however, the progress of the disease is arrested. The ordinary type of rodent ulcer responds almost as to a charm,

and in about six or eight weeks after treatment a smooth, non-depressed cicatrix is left, in many cases not to be distinguished from the normal skin. These cases have remained without recurrence ever since they were treated, which in my personal experience is a matter of five years."

"Twenty-seven cases of cutaneous epithelioma have been under my observation. When confined to the skin, these lesions, in my experience, respond as well as do the rodent ulcers. If, however, the condition has been allowed to progress so as to involve the underlying muscle or bone, the results are not so satisfactory. Particularly has this been found to be the case where the X-ray has been previously employed. The vitality of the tissue seems to be impaired to such an extent that cicatrization does not occur, and although the progress of the disease can be arrested, complete healing does not take place. On the other hand, if such cases of cutaneous epitheliomata come under treatment before the process has extended so deeply, no type of lesion gives more satisfactory results."

"In several cases radium has been used as a prophylactic against recurrence after excision for cutaneous carcinoma. I have no doubts as to the wisdom of this proceeding. So often cases have been met with where recurrence has followed surgical removal, that it seems to me justice is not being done to the patient if post operative radiation is not advised."

"I have found radium to be most useful in controlling epithelioma of the eyelids where operative procedure must of necessity produces considerable deformity. Rodent ulcer, when it affects the eyelids, is also amenable; the apparatus can be readily applied, practically no inconvenience is caused to the patient, and within five or six weeks the healing process is completed."

"Epithelioma of the nasal mucous membrane is not a very common condition, and my experience has been limited to one case, the result in which was satisfactory."

"My experience in epithelioma of the lip has been much more favorable than that which is reported by certain other authorities. When the malignant process involves the underlying tissues or has extended on to the mucous membrane of the mouth, I would hesitate to treat by radium alone. There are, however, certain early conditions where the lesion is confined to the superficial tissue at the muco-cutaneous margin, in which radium exerts, in my experience, quite as favorable an action as it does on such lesions of the skin. Out of six such cases all have responded favorably."

"Most authorities on radium speak of the difficulties in obtaining a satisfactory result where cartilaginous tissues are involved. With this statement I would in general agree, and yet I have seen cases where most excellent results were obtained in spite of the fact that the process had extended to cartilage. These were cases which involved the auricle, secondary to the skin over the post-aricular region."

"Twenty-seven cases of carcinoma of the breast have come under my observation. Surgical measures have been used in all

cases, with the exception of one of *Paget's* diseases of the nipple, in which the patient refused operation. In 18 cases there was unoperable recurrence following operation; in 8 cases radium was used as a prophylactic immediately following operation. In none of these latter cases has there been any recurrence. Of the 18 inoperable cases, 9 have since died, 3 from other causes, and 6 from the malignant condition. It may be said that in none of these cases was a curative result looked for. The treatment was palliative, and as such was a success. In the other 9 cases, however, the results have exceeded all expectations and the recurrences present have remained quiescent and in some retrogressed. Particular success was obtained in one case where there were two large masses adherent to the sternum. By inserting a radium tube through an incision into the masses, and allowing it to remain long enough to produce quite severe symptomatic reaction, very great improvement resulted. There was considerable necrosis of the tissues followed by a discharge. The size of the tumor mass decreased, the sinus has cleared up, and altogether the result is very satisfactory. She has remained under observation for over a year and has decidely improved."

"The use of radium in certain gynaecological conditions has in many cases given very satisfactory results. This is a field for radium therapy on which I would like to lay special emphasis, for the method of treatment is so comparatively simple and the results, as I have said, so encouraging, that one may be pardoned for being enthusiastic over the procedure."

"I have treated 20 cases of sarcoma with radium. In all cases the treatment was either used as a palliative in inoperable cases or combined with operative procedures. Some of the cases were from the first recognized to be absolutely hopeless, and radium treatment was undertaken only at the request of the attending physician and the friends of the patient. Six of these cases I regard as cures. In all of them there had been recourrence following operation. Under the use of radium the condition subsided and the patients are now well and in good health."

"I am fully convinced that radium does exert a decidely curative influence on sarcomata. It is, however, essential that heavy doses should be employed, as otherwise the treatment offers no prospect of success. I should also like to repeat here the statement which I have previously made that I do not advise radium treatment in cases in which operation is possible. The point I wish to emphasize is that, judging from my own experience, every case of sarcoma which is treated surgically should afterwards receive the benefit of radium treatment, and that where surgery cannot be used radium offers a very good prospect of retarding the development of the malignant process, ameliorating the symptoms, and prolonging life in a condition of comparative comfort."

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